

Amendment to the Claims

1. (Currently Amended) A receiver comprising:
 - a receiving section which receives a resultant signal obtained by transmitting a transmission signal obtained by modulating a signal including a known signal and a data signal successively, and outputs the received resultant signal as a received signal;
 - an estimation section which estimates transmission path characteristics;
 - a compensation section which compensates for a portion of the received signal which corresponds to the data signal, ~~using the transmission path characteristics~~, and outputs the compensated signal as a compensated data signal;
 - a demodulation section which demodulates the compensated data signal, and outputs the demodulated signal as a demodulated data signal; and
 - a modulation section which modulates the demodulated data signal, and outputs the modulated signal as a modulated data signal, and

wherein said estimation section

- (a) compares a portion of the received signal which corresponds to the known signal with a resultant signal obtained by modulating the known signal, and
- (b) compares ~~the~~ a portion of the received signal which corresponds to the data signal with a portion of the modulated data signal which corresponds to the data signal, thereby to estimate the transmission path characteristics, and

said compensation section compensates for a portion of the received signal, which corresponds to the data signal, using the transmission path characteristics which are estimated by comparing a preceding portion of the received signal with the resultant signal corresponding to the preceding portion of the received signal.

2. (Original) The receiver according to claim 1, wherein a portion of the received signal which has not yet been compensated is compensated using a portion of the transmission path characteristics which have already been estimated.

3. (Original) The receiver according to claim 1, wherein said estimation section outputs impulse responses which are obtained by performing (a) and (b), as transmission path characteristics.

4. (Original) The receiver according to claim 1, wherein:
said modulation section modulates the known signal, and outputs the modulated signal as a modulated-known signal; and

said estimation section performs (a) and (b), using the modulated-known signal, as a resultant signal obtained by modulating the known signal.

5. (Currently Amended) The receiver according to claim 1, A receiving comprising:
a receiving section which receives a resultant signal obtained by transmitting a transmission signal obtained by modulating a signal including a known signal and a data signal successively, and outputs the received resultant signal as a received signal;
an estimation section which estimates transmission path characteristics;
a compensation section which compensates for a portion of the received signal which corresponds to the data signal, and outputs the compensated signal as a compensated data signal;
a demodulation section which demodulates the compensated data signal, and outputs the demodulated signal as a demodulated data signal; and
a modulation section which modulates the demodulated data signal, and outputs the modulated signal as a modulated data signal, and

wherein said estimation section

(a) compares a portion of the received signal which corresponds to the known signal with a resultant signal obtained by modulating the known signal, and

(b) compares a portion of the received signal which corresponds to the data signal with a portion of the modulated data signal which corresponds to the data signal, thereby to estimate the transmission path characteristics;

wherein the transmission signal is obtained by modulating the signal including the known signal and the data signal, using a multi-carrier transmission technique, and said receiver:

further comprises a divider which divides the received signal at each carrier frequency according to the multi-carrier transmission technique, and outputs the divided signals as a group of received signals, and;

uses the group of received signals in place of the received signal, a group of compensated data signals in place of the compensated data signal, a group of demodulated data signals in place of the demodulated data signal, a group of modulated data signals in place of the modulated data signal, and a number of the group of compensated data signals, demodulated data signals and modulated data signals being equal to or smaller than a number of the group of received signals.

6. (Original) The receiver according to claim 5, wherein:

carrier frequencies according to the multi-carrier transmission technique overlap each other; and

said divider divides the received signal using FFT (Fast Fourier Transformation).

7. (Original) The receiver according to claim 5, further comprising an output section which restores a data signal included in the transmission signal before being modulated, to its original signal using the group of demodulated data signals, and outputs the demodulated data signal as a transmission data signal.

8. (Currently Amended) A method for receiving a data signal, comprising the steps of:

receiving a resultant signal obtained by transmitting a transmission signal obtained by modulating a signal including a known signal and a data signal successively, and outputting the received signal as a received signal;

estimating transmission path characteristics;

compensating for a portion of the received signal which corresponds to the data signal, ~~using the estimated transmission path characteristics~~, and outputting the compensated portion as a compensated data signal;

demodulating the compensated data signal, and outputting the demodulated data signal as a demodulated data signal; and

modulating the demodulated data signal, and outputting the modulated signal as a modulated data signal, and

wherein said step of estimating the transmission path characteristics includes the steps of

(a) comparing a portion of the received signal which corresponds to the known signal with a resultant signal which is obtained by modulating the known signal, and

(b) comparing ~~the~~ a portion of the received signal which corresponds to the data signal with a portion of the modulated data signal which corresponds to the data signal, thereby estimating the transmission path characteristics, and

in said compensation step, compensating for a portion of the received signal, which corresponds to the data signal, using the transmission path characteristics which are estimated by comparing a preceding portion of the received signal with the resultant signal corresponding to the preceding portion of the received signal.

9. (Original) The method according to claim 8, wherein a portion of the received signal which has not yet been compensated is compensated using a portion of the transmission path characteristics which have already been estimated.

10. (Original) The method according to claim 8, wherein said step of estimating the transmission path characteristics includes a step of outputting impulse responses which are obtained by performing the steps (a) and (b), as transmission path characteristics.

11. (Original) The method according to claim 8, wherein:
said step of modulating includes a step of modulating the known signal and a step of outputting the modulated known signal as a modulated signal; and
said step of estimating includes the steps (a) and (b), while using a resultant signal which is obtained by modulating the known signal.

12. (Currently Amended) The method according to claim 8, A method for receiving a data signal, comprising the steps of:

receiving a resultant signal obtained by transmitting a transmission signal obtained by modulating a signal including a known signal and a data signal, and outputting the received resultant signal as a received signal;

estimating transmission path characteristics;

compensating for a portion of the received signal which corresponds to the data signal, and outputting the compensated signal as a compensated data signal;

demodulating the compensated data signal, and outputting the demodulated signal as a demodulated data signal; and

modulating the demodulated data signal, and outputting the modulated signal as a modulated data signal, and

wherein said step of estimating the transmission path characteristics includes the steps of:

(a) comparing a portion of the received signal which corresponds to the known signal with a resultant signal obtained by modulating the known signal, and

(b) comparing a portion of the received signal which corresponds to the data signal with a portion of the modulated data signal which corresponds to the data signal, thereby estimating the transmission path characteristics;

wherein the transmission signal is obtained by modulating a signal including a known signal and a data signal, using a multi-carrier transmission technique, and

wherein said method further comprises a step of dividing the received signal at each carrier frequency, using the multi-carrier transmission technique, and outputting the divided signals as a group of received signals, and

uses the group of received signals in place of the received signal, a group of compensated data signals in place of the compensated data signal, a group of demodulated data signals in place of the demodulated data signal, a group of modulated data signals in place of the modulated data signal, and a number of the groups of compensated data signals, demodulated data signals and modulated data signals being equal to or smaller than a number of the group of received signals.

13. (Original) The method according to claim 12, wherein:
carrier frequencies according to the multi-carrier transmission technique overlap each other; and
said step of dividing includes a step of dividing the received signal using FFT (Fast Fourier Transformation).

14. (Original) The method according to claim 12, further comprising a step of restoring a data signal included in the transmission signal before being modulated, to its original signal using the group of demodulated data signals, and outputting the demodulated data signal as a transmission data signal.

15. (Currently Amended) A computer readable information recording medium which records a program which makes a computer function as:

a receiving section which receives a resultant signal obtained by transmitting a transmission signal obtained by modulating a signal including a known signal and a data signal successively, and outputs the received signal as a received signal;
an estimation section which estimates transmission path characteristics;
a compensation section which compensates for a portion of the received signal which corresponds to the data signal, ~~using the transmission path characteristics~~, and outputs the compensated portion as a compensated data signal;
a demodulation section which demodulates the compensated data signal, and outputs the demodulated signal as a demodulated data signal; and
a modulation section which modulates the demodulated data signal, and outputs the modulated signal as a modulated data signal, and

wherein said estimation section

(a) compares a portion of the received signal which corresponds to the known signal with a resultant signal obtained by modulating the known signal, and

(b) compares ~~the~~ a portion of the received signal which corresponds to the data signal with a portion of the modulated data signal which corresponds to the data signal, thereby to estimate the transmission path characteristics, and

said compensation section compensates for a portion of the received signal, which corresponds to the data signal, using the transmission path characteristics which are estimated by comparing a preceding portion of the received signal with the resultant signal corresponding to the preceding portion of the received signal.

16. (Original) The information recording medium according to claim 15, wherein said program controls the computer to function for compensating for a portion of the received signal which has not yet been compensated using a portion of the transmission path characteristics which have already been estimated.

17. (Original) The data information recording medium according to claim 15, wherein said program controls said estimator to output impulse responses which are obtained by performing (a) and (b), as the transmission path characteristics.

18. (Original) The information recording medium according to claim 15, said program controls:

 said modulation section to modulate the known signal and output the modulated signal as a modulated-known signal; and

said estimation section performs (a) and (b), using the modulated-known signal as a resultant signal obtained by modulating the known signal.

19. (Currently Amended) ~~The information recording medium according to claim 15, wherein:~~ A computer readable information recording medium which records a program which makes a computer function as:

a receiving section which receives a resultant signal obtained by transmitting a transmission signal obtained by modulating a signal including a known signal and a data signal successively, and outputs the received resultant signal as a received signal;

an estimation section which estimates transmission path characteristics;

a compensation section which compensates for a portion of the received signal which corresponds to the data signal, and outputs the compensated signal as a compensated data signal;

a demodulation section which demodulates the compensated data signal, and outputs the demodulated signal as a demodulated data signal; and

a modulation section which modulates the demodulated data signal, and outputs the modulated signal as a modulated data signal, and

wherein said estimation section

(a) compares a portion of the received signal which corresponds to the known signal with a resultant signal obtained by modulating the known signal, and

(b) compares a portion of the received signal which corresponds to the data signal with a portion of the modulated data signal which corresponds to the data signal, thereby to estimate the transmission path characteristics;

the transmission signal is obtained by modulating a signal including a known signal and a data signal, using a multi-carrier transmission technique; and

and said program further controls the computer to function as a divider which divides the received signal at each carrier frequency according to the multi-carrier transmission technique, and outputs the divided signals as a group of received signals, and

uses the group of received signals in place of the received signal, a group of compensated data signals in place of the compensated data signal, a group of demodulated data signals in place of the demodulated data signal, a group of modulated data signals in place of the modulated data signal, and a number of the groups of compensated data signals, demodulated data signals and modulated data signals being equal to or smaller than a number of the group of received signals.

20. (Original) The information recording medium according to claim 19, wherein:

carrier frequencies according to the multi-carrier transmission technique overlap each other; and

said program controls said divider to divide the received signal using an FFT (Fast Fourier Transformation) technique.

21. (Original) The information recording medium according to claim 19, wherein said program controls the computer to function as an output section which restores a data signal included in the transmission signal before being modulated, to its original signal using the group of demodulated data signals, and outputs the demodulated data signal as a transmission data signal.

22. (Original) The information recording medium according to claim 15, wherein said medium is a compact disk, floppy disk, hard disk, magneto-optical disk, digital video disk, magnetic tape, or semiconductor memory.